dim, Nicol or no Nicol, showing that the typical autumnal haze, often whitish blue near the horizon, acts mainly by general obstruction and diffusely reflecting a good deal of light, the polarized component being usually only moderately strong.

Haze in general is well known to be due simply to suspended particles of one sort or another, and haze which produces polarization, as well as the ordinary sky polarization, is well known to be due to particles, whether of dust or water, or of other nature, small compared with the wave-length of light. Lord Rayleigh[2] has given the theory of this action in considerable detail.

The polariscope integrates the effect of such particles along the line of sight, and this information may have considerable meteorological significance. The light-scattering particles which produce sky polarization are much finer than those which produce coronas and similar phenomena, with the beginnings of ordinary reflection. In artificial fogs the nuclei gradually grow from the polarizing dimensions to those which scatter white light and become visible. It is not easy to assign exact dimensions to the finer particles. They are quite certainly much less than a quarter wave-length in diameter, that is, say 100 $\mu\mu$, and probably run very much smaller. From the very exhaustive work of Barus[3] it appears that the diameter of the particles to which visible fog and coronas in a fog chamber of laboratory dimensions are due range from .0005 μ upwards, those near this limit showing as fog, while the coronas began to form as the diameters reached 10 μ and above. The fog particles to which lunar coronas are due often rise to greater dimensions, 20 or 30 μ.

Now such fog particles are the preliminary to rain, which forms by the accretion of these particles to a size that readily falls; and it is well known that water vapor, even when saturated as shown by the psychrometer, will not begin to condense to visible fog unless in the presence of nuclei about which aggregation takes place. These may be of very fine dust, or even of water particles electrically charged to an extent that resists the surface tension that would otherwise promote evaporation. Such charged aqueous nuclei may exist in unsaturated air at very small diameters, down to 1 or 2 $\mu\mu$, as has been shown by J. J. Thomson,[4] by Wilson,[5] and by others. Between these almost molecular dimensions and those indicated by coronas are the light scattering particles active in sky polarization. Their effect, that is, the amount of light scattered, varies, as Rayleigh[6] has shown, as the inverse fourth power of the wave-length of the light affected and directly as their volume, assumed to be small compared with a wave-length. Now plotting the resulting equation, $I = \frac{\kappa A}{\lambda^4}$, one obtains a group of curves shown in fig. 1 [omitted], which discloses the cause of the familiar intense blue of the scattered light. As larger particles grow during the process of nucleation or are present as dust, the blue gets weak and whitish from the scattering of white light. Near the horizon, where the light traverses a long reach of atmosphere and coarser dust is common, one gets the familiar weakening of the sky blue.

The process of increasing nucleation, which results in cloud formation and frequently in subsequent rain, can be followed very closely by the polariscope. A fall in polarization, particularly when the spectroscope shows the presence of much aqueous vapor, indicates the progress of nucleation.

On several occasions I noted this phenomenon in the Breezy Point observations. Starting with strong polarization on the distant hills to the southward and a strong rain band visible in the spectroscope, the next few hours showed a conspicuous weakening of the polarization, followed presently by the formation of visible clouds, and in at least two cases by precipitation. In short, if from change of temperature or other cause cloud is due to form in any particular direction, the nucleation which precedes visible fog formation is bound, other things being equal, to cut down the polarization. The prognostic value of this process depends largely upon the rate at which it progresses. In two instances which I noted, the decrease toward the south occupied most of an afternoon. Of course a drifting in of coarser dust particles would produce weakening of polarization, but the concurrence of weakening with a heavy rain band intimates very strongly that nucleation is progressing.

A detailed study of the changes would require the use of a sensitive polarimeter, by which variations from the theoretical polarization could be accurately measured. Observations of this kind, made where there is a wide sweep of horizon, should frequently disclose incipient cloud formation and the causes which produce it. The use of a spectro-polarimeter would be very desirable, as showing by the change in the quality of the scattered light the progress of events. The nature of the minute nuclei, whether dust or water particles, is not definitely known. After a heavy rainstorm the lower strata seemed to have been cleared pretty effectively of polarizing nuclei, while the upper sky remained much as before. On one occasion, more than twenty years ago, I was taking rain-band observations on Moosilauke and was favored with a day in which the distant peaks, even up to 100 miles, stood out almost as black as silhouettes, while the sky took on a deep hue almost startling in its unfamiliarity. A polarimeter would certainly have given extremely interesting results had it been at hand. It seems quite possible that one might get a fairly clear idea of the relative number and distribution of nuclei in the upper air by such means.

It would certainly be interesting also to find out whether the apparently very strong absorption of ultra-violet rays by the atmosphere is due to any genuine absorption or merely to a serious loss of light by lateral scattering, which Rayleigh has shown may perhaps be due to the air molecules themselves. In the lower strata my observations pointed rather to dust than to minute water nuclei, since a whitish haze showed powerful polarization on near-by peaks, making it clear that the haze was extremely heterogeneous. The conditions which would produce stable water nuclei of strongly polarizing size on a clear day would tend to reduce larger droplets to the similar order of magnitude instead of leaving them to superimpose specular reflection.

I am not disposed to suggest that in the polariscope we have a meteorological tool of vast importance, but my preliminary observations certainly show that it gives a most instructive view of the very early stages of atmospheric nucleation, and especially if combined with rain-band observations it should have material prognostic value as regards comparatively local conditions. There is also a chance for forming a clearer idea of the conditions of nucleation in the upper air, including the very high altitudes, since polarization is manifest after the sun is so far below the horizon as to illumine only the upper strata. I bring the preliminary facts to notice here in the hope that some one with a suitable location and opportunity for systematic observation may find them useful as a guide to further work along this line.

[2] Phil. Mag., 1871, p. 107 et seq.
[3] Smithsonian Cont., No. 1373.
[4] The Discharge of Electricity thru Gases. [5] Phil. Trans., 1897.
[6] Rayleigh, loc. cit.

NOTES FROM THE WEATHER BUREAU LIBRARY.

By C. FITZHUGH TALMAN, Librarian.

UPPER AIR RESEARCH IN GREAT BRITAIN.

The active part that British observers are now taking in the world-wide campaign of upper air research was reflected in the prominence given to this topic at the last Royal Society conversazione held at Burlington House, May 13, 1908. The sub-

ject was illustrated by exhibits by Dr. W. N. Shaw, J. E. Petavel, W. A. Harwood, C. J. P. Cave, Capt. C. H. Ley, E. S. Bruce, and the director of the Egyptian Survey Department.

Daily ascents are now made at the Howard Estate Meteorological Station of the University of Manchester, situated at Glossop Moor, Derbyshire, and the results are published in a monthly bulletin. The work at this station is to continue for two years from January 1, 1908. The necessary funds were mainly contributed by Dr. Arthur Schuster, of the University of Manchester, and Mr. J. E. Petavel has immediate charge of the observations.

Upper air observations are made by Mr. Dines, for the Meteorological Office, at Pyrton Hill, Oxfordshire, by Mr. Cave at Ditcham Park, Petersfield, and by Mr. S. H. K. Salmon at Brighton. In connection with the scheme of simultaneous observations under the direction of the International Committee on Scientific Aeronautics observations have been made during the past year at several other points in the British Isles.

A METEOROLOGICAL STATION ON THE ELBRUZ.

Globus of May 7, 1908, announces that a project is on foot to erect a meteorological and astronomical station on Mount Elbruz (18,526 feet), the highest summit in the Caucasus. The estimated cost, 20,000 rubles, the president of the Caucasus Alpine Club, M. Leutzinger, hopes to raise in part from various learned societies.

This giant mountain, which forms a conspicuous feature of the landscape of southeastern Russia, is much higher than Mont Blanc, and, we believe, than any other mountain that is at present the site of a meteorological station.

ENGLISH ABSTRACTS OF JAPANESE METEOROLOGICAL PAPERS.

The monthly Journal of the Meteorological Society of Japan, now in its twenty-seventh year, has begun publishing English abstracts of the Japanese contents of each number. This excellent innovation makes available to occidental readers a wide range of meteorological literature, as may be judged from the following titles of abstracts published in the number for March, 1908:

M. Ishida—Diurnal variation of the wind velocity.

K. Asakura—Relation of the climate and tobacco cultivation.

M. Sato—Meteorological observations at sea.

J. Sato—On cloudy morning weather.

H. Ogiwara—The climate and rice crops.

Y. Takashima—Precipitation near Mokpo.

K. Asakura—Remarkable rainfall at Yokohama on January 15, 1908.

M. Ishida—Climate of south China.

The paper last named is a summary of observations made for the last three years at Hangchow, Nanking, Hankow, and Shashi, and is one of the first fruits of the recent invasion of China by the Japanese meteorologists.

METEOROLOGICAL EXPLORATION IN KAMCHATKA.

The Scottish Geographical Magazine states that a large exploring expedition, organized by M. T. P. Riabouchinsky, left St. Petersburg in May for Kamchatka. Meteorology is one of the principal subjects to be pursued by the expedition, which will spend eighteen months in Kamchatka. Meteorological stations will be established at Tigil, Kintchevska village on the Kamchatka River, and Petropavlovsk.

THE SYMONS MEDAL.

The Symons Memorial Gold Medal, which is awarded biennially by the Royal Meteorological Society, has been presented this year to M. Léon Teisserenc de Bort.

M. Teisserenc de Bort was a member of the staff of the Bureau Central Météorologique de France from 1878 to 1892. In the latter year he resigned in order to devote his entire attention to experimental research in meteorology, and in 1896 he founded a private observatory for the study of dynamic meteorology at Trappes, near Paris. His recent work has been chiefly in the field of upper air research, including the well-known expeditions of the yacht *Otaria* (in connection with Mr. A. Lawrence Rotch), and the comparison of upper air temperatures in different latitudes.

EXHIBITION OF METEOROLOGICAL AND GEOPHYSICAL INSTRUMENTS.

An international exhibition of meteorological and geophysical instruments will be held at Faenza, Italy, in connection with the celebration of the tercentenary of the birth of Torricelli, during the months of August, September, and October of this year. A prize of 2,000 francs will be awarded to the meteorological or geophysical instrument exhibited that is judged to be the best innovation, either from its principle or from its application to some principle already known.

WILLIAM M. HUSSON.

Mr. William M. Husson, whose death in his 53d year, occurred in Washington, D. C., on May 10, 1908, entered the Weather Bureau Service in August, 1890, and served continuously as draftsman at the Central Office, with the exception of about a year during the war with Spain when he was engaged in the military service of the United States as Captain of Company D, 1st Regiment, Florida Volunteers. He was a skilful and intelligent workman and a man of excellent character and disposition.—*H. E. W.*

ICE MOVEMENTS AND CURRENTS IN BERING STRAIT.

Mr. James F. Cross, Government teacher at Wales, Alaska, has for the past three years kept notes of the ice movements and currents in Bering Strait. This spring, on May 28, in response to a request from the special observer of the Weather Bureau at Nome, Alaska, he telegraphed the following information:

April 6.—Ice all clear from the straits and was open water to the Diomedes [Islands] and as far north and south as you could see. Current moving south.

April 11.—Current changes and brought ice into the straits for five days.

April 17.—Current south. Ice cleared and water full of young ice. Since this date no ice floes have come into the straits, and as far as you can see the water is open. The natives are not able [to] account for no ice coming down with both the wind and current from the north.

April 27.—Strong current from the south. Wind northeast, but the ice did not move up from the south. The current varies from day to day. As the only way to measure is by the floating ice it is hard to estimate velocity. Compared with other years there is much less ice in quantity. A letter dated February 23, at Icy Cape, says: "The ice pack did not come down from the north." Last reports from the Diomedes Islands indicate that the ice in the west straits has been light and there is now plenty of open water there. Walrus are running in large numbers east of Diomedes Islands.

CORRIGENDA.

MONTHLY WEATHER REVIEW for March, 1908, Vol. XXXVI, No. 3, Chart XIV, in lower left-hand corner the legends for the two colors, green and red, should be interchanged, making *red* indicate "Not crost by paths" and *green* "crost by paths."

MONTHLY WEATHER REVIEW for April, 1908, Vol. XXXVI, No. 4, page 87, column 1, second line of text of "Chinook winds, etc.," for "Charts IX and X" read "Charts XVI and XVII". Page 103, column 2, in Table 1, left-hand column, for "Ghent" read "Geneva". Page 105, in Table 4, right-hand column, line for July, for "0.495" read "0.0495".